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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/818,498	03/28/2001	Nobuaki Usui	1075.1155	1215

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EXAMINER	
LEE, TOMMY D	

ART UNIT	PAPER NUMBER
2624	

DATE MAILED: 03/17/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/818,498	USUI ET AL.	
	Examiner	Art Unit	
	Thomas D. Lee	2625	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *27 December 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-43* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *14,18 and 30* is/are allowed.

6)☒ Claim(s) *1-13,16,17,20-27 and 32-43* is/are rejected.

7)☒ Claim(s) *15,19,28,29 and 31* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on December 27, 2005 has been entered.

Response to Amendment

2. This Office action is responsive to applicant's amendment filed November 28, 2005. Claims 1-43 are pending.

Claim Rejections - 35 USC § 103

3. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

4. Claims 1, 2, 7-11, 16, 17, 32-35 and 40-43 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 5,107,346 (Bowers et al.) in view of U.S. Patent 5,757,517 (Couwenhoven et al.).

Regarding claims 1, 2, 7 and 42, Bowers et al. disclose a halftoning method of converting a multilevel input image into a binary image, comprising the steps of: calculating the multilevel value of a given noteworthy pixel of the multilevel input image, as an estimated value of the noteworthy pixel based on the multilevel values of pixels (Gray level to be quantized based on a weighted quantization error, which is obtained

from previously quantized pixels (column 7, line 67 – column 8, line 18). Errors are based on comparison of prior multilevel pixels and a threshold value, and thus estimated value of noteworthy pixel based, at least indirectly, on multilevel values of prior pixels, and converting the estimated multilevel value of the noteworthy pixel into a binary value in accordance with multilevel values each time the multilevel input image is converted into a binary image (column 6, lines 46-60; column 8, lines 36-43). In said calculating step, the estimated value of the noteworthy pixel is calculated based on the multilevel values of pixels in a predetermined area that is a predetermined distance apart from the noteworthy pixel (Noting Fig. 2, errors obtained at a current pixel p distributed to adjacent pixels d1-d4 a predetermined distance away. Subsequently, the multilevel values of each adjacent pixel d1-d4 are determined, based in part on the error distributed from the current pixel p). A simple threshold method is used in said converting in step (b) (column 6, lines 46-63).

Bowers et al. do not disclose calculation of the multilevel value, based on the multilevel values of pixels *other than a value of the noteworthy pixel*. However, this limitation is disclosed in Couwenhoven et al. (column 5, line 46 to column 6, line 17; column 6, line 43 –column 7, line 11). One of ordinary skill in the art would have realized that in view of Couwenhoven et al. worm and edge artifacts associated with prior art error diffusion methods are minimized or eliminated (column 5, lines 26-29). Therefore, it would have been obvious for one of ordinary skill in the art to modify the teaching of Bowers et al. by providing an activity detector using neighboring pixels in the

vicinity of a noteworthy pixel for calculating the multilevel value of the noteworthy pixel, as disclosed in Couwenhoven et al.

Regarding claims 8 and 9, the method of Bowers et al. further comprises diffusing a possible error, which has occurred in binary value with respect to the noteworthy pixel, to multilevel pixels adjacent to the noteworthy pixel by a technique, wherein a possible error, which has occurred in binary value with respect to the noteworthy pixel, is diffused to the pixels based on which the estimated value of the noteworthy pixel is calculated in step (a) (column 7, line 67 - column 8, line 18).

Regarding claims 10 and 11, the method of Bowers et al. further comprises changing the technique of said error diffusing to another technique in accordance with a predetermined manner as the scanning of the pixels of the multilevel input image progresses (Error diffusion technique is effectively changed by application of pseudo-random weights for propagating error values (column 7, lines 32-59)).

Regarding claims 16 and 17, in Bowers et al., in said changing, the error diffusion technique is changed for every pixel of the multilevel input image (Application of pseudo-random weights (column 7, lines 32-59) results in random error values propagated for each pixel, which demonstrates a change in error diffusion technique for each pixel).

Regarding claims 32 and 33, in Bowers et al., in said changing, the error diffusion technique is changed to another technique that is selected at random from various different error diffusion techniques (column 7, lines 32-59).

Regarding claims 34 and 35, in Bowers et al., in said error diffusing, the error diffusion technique is a technique of proportionally distributing the occurred error to the plural unscanned pixels adjacent to the noteworthy pixel in accordance with a predetermined weighting pattern (column 7, line 67 – column 8, line 18), and in said changing, the error diffusion technique is changed by changing said predetermined weighting pattern to another pattern (column 7, lines 32-59).

Claim 40 is an apparatus claim corresponding to above-rejection method claim 1. The means for performing the method steps of claim 1 are disclosed in Bowers et al. in view of Couwenhoven et al., as mentioned above.

Claim 41 further recites assigning an estimated value without using a multilevel value of the pixel *without using a multilevel value of the pixel regardless of value thereof*. In Couwenhoven et al., the neighboring pixels in the vicinity of the noteworthy pixel used to compute the activity signal may include the current pixel, adjacent pixels and/*or* nearby pixels (column 5, lines 57-58). Thus, the current pixel, *or* the adjacent pixels, *or* nearby pixels, *or* any combination thereof, can be used for determining the activity signal.

Claim 43 further recites calculation of a multilevel value of a given noteworthy pixel, based on the multilevel values of non-binarized pixels, other than the noteworthy pixel, *downstream of the noteworthy pixel in a primary scanning direction or in a secondary scanning direction*. In Couwenhoven et al., the estimated value of the noteworthy pixel is calculated using a two-dimensional digital filter for the multilevel pixels in the predetermined area, said digital filter being a two-dimensional digital

Prewitt filter dedicated to profile enhancement (column 5, lines 50-53). As is well known in the art, the Prewitt filter utilizes neighboring pixels surrounding the noteworthy pixel. The neighboring pixels to the right of and below the noteworthy pixel are inherently positioned downstream of the noteworthy pixel.

5. Claims 1-6, 8-13, 20-27 and 36-43 are rejected under 35 U.S.C. 103(a) as being unpatentable over Couwenhoven et al.

Regarding claims 1-6 and 42, Couwenhoven et al. disclose a halftoning method of converting a multilevel input image, comprising the steps of: calculating the multilevel value of a given noteworthy pixel of the multilevel input image, as an estimated value of the noteworthy pixel, based on the multilevel values of pixels other than a value of the noteworthy pixel (column 5, line 46 to column 6, line 17; column 6, line 43 –column 7, line 11); and converting the estimated multilevel value of the noteworthy pixel in accordance with the multilevel values each time the multilevel image is converted into a binary image (column 7, lines 12-17). In said calculating, the estimated value of the noteworthy pixel is calculated based on the multilevel values of pixels in a predetermined area that is a predetermined distance apart from the noteworthy pixel (column 5, lines 48 and 49, lines 53-65); the estimated value of the noteworthy pixel is calculated using a two-dimensional digital filter for the multilevel pixels in the predetermined area, said digital filter being a two-dimensional digital Prewitt filter dedicated to profile enhancement (column 5, lines 50-53).

The method disclosed in Couwenhoven et al. is not explicitly disclosed as converting the estimated multilevel value of the noteworthy pixel into a binary value, or

said two-dimensional digital filter being a Laplacian filter. However, it is well known in the art that error diffusion methods are conventionally performed so as to convert multilevel input image data to image data of one of two levels according to the printing or display capabilities of an output device (column 1, lines 32-42). As many, if not most, printers print in one of two levels, it would have been obvious for one of ordinary skill in the art to apply the error diffusion method disclosed in Couwenhoven et al. to a binary printer so as to remove artifacts that appear in an output image as a result of conventional error diffusion methods (column 3, lines 3-52). Regarding the use of a Laplacian filter, it is stated at column 5, lines 50-53 that activity detector 80 may take the form of an edge detection filter, and two examples are given (Sobel and Prewitt). The Laplacian filter is a well-known filter used in detecting edges in image data, and in view of the statement by Couwenhoven et al. it would have been obvious for one of ordinary skill in the art to use a Laplacian filter as an alternative to the Sobel or Prewitt filters.

Regarding claim 38, the apparatus claim corresponds to above-rejected method claim 1. The components of the apparatus claim are either disclosed in, or would have been obvious in view of, Couwenhoven et al. for the reasons set forth above.

Regarding claim 39, Couwenhoven et al. do not explicitly disclose a computer-reading recording medium for instructing a computer to perform the method steps of above-rejected claim 1. However, it is well known in the art to provide a recording medium with programming code for instructing a computer to perform processing steps in general, so that the steps may be performed in a computer without the need for specific separate hardware for performing each of the steps, and thus providing

computer-reading recording medium for use by a computer would have been obvious to one of ordinary skill in the art.

Regarding claims 8-13, Couwenhoven et al. further disclose diffusing a possible error, which has occurred with respect to the noteworthy pixel, to multilevel pixels adjacent to the noteworthy pixel by a technique, wherein a possible error, which has occurred in binary value with respect to the noteworthy pixel, is diffused to the pixels based on which the estimated value of the noteworthy pixel is calculated in step (a) (column 6, lines 43-62; column 7, lines 18-34). The method further comprises of changing the technique of said error diffusing to another technique in accordance with a predetermined manner as the scanning of the pixels of the multilevel input image progresses and discriminating whether or not the noteworthy pixel is a pixel constituting part of a profile of the multilevel input image, the error diffusion technique being changed from one to another in said changing when the result of said discrimination is positive (column 6, lines 18-35).

Regarding claims 20-27, in the method disclosed in Couwenhoven et al., said profile discrimination is carried put by calculating a profile value of the noteworthy pixel based on both the multilevel value of the noteworthy pixel and those of the adjacent pixels and then comparing the calculated profile value with a predetermined value (column 6, lines 18-27). A two-dimensional digital Prewitt filter dedicated to profile enhancement is used in said calculating of the profile value (column 5, lines 50-53). As mentioned above, the Laplacian filter is a well-known filter used in detecting edges in image data, and in view of the statement by Couwenhoven et al. it would have been

obvious for one of ordinary skill in the ad to use a Laplacian filter as an alternative to the Sobel or Prewitt filters.

Regarding claims 36 and 37, Couwenhoven et al. do not explicitly disclose carrying out said discrimination for only one of plural multilevel images, and using the result of said discrimination in halftoning remaining multilevel input images having substantially identical profile. However, it is rather obvious for one of ordinary skill to process all identical images in like manner, and that carrying out separate discriminations on images having identical profile would be much more time consuming that need be, given that the results of the discrimination has been obtained for the first image. Thus, it would have been obvious for one of ordinary skill in the art to carry out a discrimination only once for plural multilevel images having identical profile.

Claim 40 is an apparatus claim corresponding to above-rejection method claim 1. The means for performing the method steps of claim 1 are suggested in Couwenhoven et al., as mentioned above.

Claim 41 further recites assigning an estimated value without using a multilevel value of the pixel *without using a multilevel value of the pixel regardless of value thereof*. As mentioned above, in Couwenhoven et al., the neighboring pixels in the vicinity of the noteworthy pixel used to compute the activity signal may include the current pixel, adjacent pixels and/*or* nearby pixels (column 5, lines 57-58). Thus, the current pixel, *or* the adjacent pixels, *or* nearby pixels, *or* any combination thereof, can be used for determining the activity signal.

Claim 43 further recites calculation of a multilevel value of a given noteworthy pixel, based on the multilevel values of non-binarized pixels, other than the noteworthy pixel, *downstream of the noteworthy pixel in a primary scanning direction or in a secondary scanning direction*. In Couwenhoven et al., the estimated value of the noteworthy pixel is calculated using a two-dimensional digital filter for the multilevel pixels in the predetermined area, said digital filter being a two-dimensional digital Prewitt filter dedicated to profile enhancement (column 5, lines 50-53), as mentioned above. As is well known in the art, the Prewitt filter utilizes neighboring pixels surrounding the noteworthy pixel. The neighboring pixels to the right of and below the noteworthy pixel are inherently positioned downstream of the noteworthy pixel.

Allowable Subject Matter

6. Claims 14, 18 and 30 are allowed.

7. Claims 15, 19, 28, 29 and 31 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

8. The following is a statement of reasons for the indication of allowable subject matter: No prior ad has been found to disclose or suggest "of detecting the direction in which the profile of the multilevel input image extends with respect to the noteworthy pixel, values according to the occurred error being added to the values of unscanned pixels along the detected direction of the profile as an exceptional process, in said error diffusing when the result of said discriminating is positive," as recited in claims 14, 15, 18 and 19; or a halftoning method "wherein the profile value is directly calculated by

making addition and subtraction individually on the multilevel values of the noteworthy pixel and the adjacent pixels," as recited in claims 28 and 29; or a halftoning method "wherein in said changing, the error diffusion technique is changed to another technique that is selected in a predetermined order from various different error diffusion techniques," as recited in claims 30 and 31.

Response to Arguments

9. Applicant's arguments, see REJECTION UNDER 35 U.S.C. § 102(b) in the current amendment, filed November 28, 2005, with respect to the rejection(s) of claim(s) 1, 2, 7-11, 16, 17, 32-35 and 40 under 35 U.S.C. 102(b) have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of Couwenhoven et al., as set forth above.

10. Applicant's arguments filed in response to the rejection of claims 1-6, 8-13, 20-27 and 36-40 under 35 U.S.C. 103(a) have been fully considered but they are not persuasive. Applicant asserts that Couwenhoven et al. use "all the pixels within a particular vicinity to compute an activity signal as a difference between maximum/minimum input pixel values of pixels within the particular vicinity (see col. 5, lines 46-65)" (see REJECTION UNDER 35 U.S.C. § 103(a) in the current amendment). However, as mentioned above, in Couwenhoven et al., the neighboring pixels in the vicinity of the noteworthy pixel used to compute the activity signal may include the current pixel, adjacent pixels and/*or* nearby pixels (column 5, lines 57-58). Thus, the current pixel, *or* the adjacent pixels, *or* nearby pixels, *or* any combination thereof, can

be used for determining the activity signal. Furthermore, with regard to claims 36 and 37, as mentioned in the prior Office action and again above, Couwenhoven et al. do not explicitly disclose carrying out said discrimination for only one of plural multilevel images, and using the result of said discrimination in halftoning remaining multilevel input images having substantially identical profile. However, it is rather obvious for one of ordinary skill to process all identical images in like manner, and that carrying out separate discriminations on images having identical profile would be much more time consuming that need be, given that the results of the discrimination has been obtained for the first image. Thus, it would have been obvious for one of ordinary skill in the art to carry out a discrimination only once for plural multilevel images having identical profile. Moreover, with regard the new claims, the rejection of these claims are as set forth above.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thomas D. Lee whose telephone number is (571) 272-7436. The examiner can normally be reached on Monday-Friday, 7:30-5:00, alternate Fridays off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David K. Moore can be reached on (571) 272-7437. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Thomas D Lee
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tdl
March 15, 2006